

CLAIMS

1. A method to screen for osteoporosis damage to a patient's bones comprising:

    placing in the mouth of the patient adjacent to a mandibular bone being tested, a dental radiographic absorptiometric device comprising at least one calibration element;

5       applying X-ray energy to said dental radiographic absorptiometric device simultaneously through said mandibular bone and said at least one calibration element to generate both a bone absorptive record from said mandibular bone and a calibration element absorptive record from said at least one calibration element; and

    analyzing said bone absorptive record against said calibration element absorptive

10 record to determine the extent, if any, of the osteoporosis damage to said mandibular bone.

2. The method as defined in claim 1 wherein said X-ray energy is provided by a device selected from the group consisting of single-energy and dual-energy devices.

15 3. The method as defined in claim 1 wherein said at least one calibration element is at least one calibration wedge and at least one beam filter.

4. The method as defined in claim 1 wherein said dental radiographic absorptiometric device is selected from the group consisting of digital and non-digital radiographic absorptiometric devices.

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5. The method as defined in claim 1 wherein said dental radiographic absorptiometric device is selected from the group consisting of a charge coupled device camera, CMOS wafers, electronic image sensors, and X-ray film.

5 6. The method as defined in claim 1 wherein said dental radiographic absorptiometric device comprises an image sensor with a fluorescent layer.

7. The method as defined in claim 1 further comprising selecting a region of interest in the mandible of the patient.

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8. The method as defined in claim 1 further comprising digitizing said bone absorptive record and said calibration element absorptive record.

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9. The method as defined in claim 7 wherein said region of interest is trabecular bone in the mandible.

10. The method as defined in claim 7 wherein said region of interest is trabecula in the area between roots of the second bicuspid and the first molar and from the superior border of the mandibular to approximately one-half of the molar root length.

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11. The method as defined in claim 8 further comprising subtracting soft tissue effects from digital images of said bone absorptive record and said calibration element absorptive

record and comparing intensities of said digital images at specific locations to determine bone density and bone mineral content.

12. The method as defined in claim 11 further comprising classifying said bone mineral  
5 content of the patient as either "normal" or "below normal" at said specific locations.

13. A dental radiographic absorptiometric device adapted for osteoporosis screening using a standard dental X-ray machine and being locatable in a patient's mouth, said device comprising:

10 an image portion having a first surface;  
a biting block portion attached to the first surface of said image portion, said biting block portion defining a cavity; and  
at least one calibration element accommodated in said cavity of said biting block portion.

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14. The dental radiographic absorptiometric device of claim 13 wherein said imaging portion is an enclosure sized to accommodate standard dental X-ray film.

15. The dental radiographic device of claim 13 wherein said imaging portion is an  
20 electronic sensor.

16. The dental radiographic device of claim 15 wherein said electronic sensor is a CCD camera provided with a fluorescent screen.

17. The dental radiographic device of claim 15 wherein said electronic sensor is selected from the group consisting of a CMOS based x-ray sensor, a CCD based x-ray sensor, and any other suitable intraoral electronic x-ray sensors.

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18. The dental radiographic device of claim 13 wherein said cavity of said biting block portion extends from said first surface of said imaging portion completely through said biting block portion.

10 19. The dental radiographic device of claim 13 wherein said biting block portion extends a distance from said imaging portion such that the device may be fully enclosed in the patient's mouth.

20. The dental radiographic device of claim 13 wherein said biting block portion extends  
15 a distance from said imaging portion such that the device protrudes partially from the patient's mouth.

21. The dental radiographic absorptiometric device of claim 13 wherein said biting block portion and said imaging portion is each a material selected from the group consisting of  
20 plastic, acrylic, methyl methacrylate, any other suitable low attenuating materials, and combinations thereof.

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22. The dental radiographic absorptiometric device of claim 13 wherein said at least one calibration element is a material selected from the group consisting of copper, copper alloys, any other suitable calibration material, and combinations thereof.

5 23. The dental radiographic absorptiometric device of claim 13 wherein said at least one calibration element is selected from the group consisting of step wedges, tapered wedges, and combinations thereof.

10 24. The dental radiographic absorptiometric device of claim 13 wherein said at least one calibration element is a step wedge having dimensions of about 3 mm by about 25 mm, and has steps of thicknesses ranging from about 0.05 mm to about 0.33 mm.

15 25. The dental radiographic absorptiometric device of claim 13 wherein said at least one calibration element is two calibration wedges.

26. The dental radiographic absorptiometric device of claim 25 wherein said calibration wedges are provided in a counter side-by-side orientation.

20 27. The dental radiographic absorptiometric device of claim 25 wherein said calibration wedges are provided in a side-by-side orientation.

28. The dental radiographic absorptiometric device of claim 25 wherein said calibration wedges are provided in crisscross arrangement.

29. A dental radiographic absorptiometric device adapted for osteoporosis screening using a standard dental X-ray machine and being locatable in a patient's mouth, said device comprising:

- 5        an image portion having a first surface;
- a biting block portion attached to the first surface of said image portion, said biting block portion defining a cavity;
- at least one calibration element and at least one of an upper beam filter accommodated in said cavity of said biting block portion; and
- 10       at least one of a lower beam filter provided to said imaging portion below said biting block portion.

30. The dental radiographic absorptiometric device of claim 29 wherein said beam filters are each a material selected from the group consisting of cerium, molybdenum, any other
- 15       suitable beam filtering material, and combinations thereof.

31. The dental radiographic absorptiometric device of claim 29 wherein said beam filters are each a thin sheet material having a thickness of about 0.05 mm to about 0.12 mm.
- 20       32. The dental radiographic absorptiometric device of claim 29 wherein said upper and lower beam filters each comprises first and second filters.

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33. The dental radiographic absorptiometric device of claim 32 wherein said first filter is 0.075 mm Ce and said second filter is 0.10 mm Mo.

34. The dental radiographic absorptiometric device of claim 32 wherein said first and 5 second filters of said upper and lower beam filters are provided in a side-by-side orientation.

35. The dental radiographic absorptiometric device of claim 29 wherein said upper and lower beam filters are exchangeable with other beam filters.